REMARKS

The Office Action was mailed in the present case on February 17, 2009, making a response due on or before May 17, 2009. Since this response is being submitted in a timely fashion, no additional fee is thought to be due at this time. If any additional fee is due, please charge the same to Applicant's Deposit Account No. 50-2555 (Whitaker, Chalk, Swindle & Sawyer, LLP).

The Examiner has raised an objection to the drawings, as filed, in that the numeral 20 on the first figure is not mentioned in the text of the Specification. Applicant has accordingly amended the Specification at page 4, line 17, to introduce the reference to the numeral 20 so that the relevant portion of the sentence now reads: "at the top 20 of the reservoir 14."

The Examiner also raised an objection to the claim language in that the term "calco-magnesian compound" is not a material. Applicant proposes to replace the term "calco-magnesian compound" with the term "calcic compound" in the claims. A reference to the alternative term has also been introduced into the Specification at page 1, lines 5-6.

The term "calcic" is defined in Webster's New World Dictionary, College Ed., 1960, as "from or having calcium or lime." As such, Applicant would submit that the introduction of the new adjective term is not "new matter" but is obvious from the remaining text of the Specification and would be understood by one skilled in the relevant art.

The Examiner also rejected Applicant's pending Claims 1-9 under 35 U.S.C. §102 as being unpatentable over the Japanese reference JP09-268012. The Japanese prior art cited by the Examiner concerns a method for manufacturing an impalpable slaked lime powder by the following method:

The method comprises:

supplying a slaked lime slurry into a fluidized bed consisting of a heated inert grains, for example, silica;

drying the aqueous slurry on the surface of the inert grains at a constant temperature;

separating the dried powder of slaked lime by taking it out of the fluidized bed, and;

recovering the powder by a solid-gas separation.

According to the teaching of the Japanese reference, it is possible to obtain a dry powder slaked lime having maintained the particle size of the slaked lime in the slurry.

It is well-known that in a fluidized bed, the larger and denser particles return to the top of the bed and the finer and lighter particles are carried upwards (see the attached copy of page 20-62 of *Perry's Chemical's Engineer's Handbook*, sixth edition, included as Attachment 1 hereto).

In the fluidized bed described in the Japanese reference, the particle size of the slaked lime is less than 50 μm, i.e., from 1.5 to 15 μm in Example 1 and 2.5 μm in Example 2.

The mean particle size of the grains of silica sand material is of 100-1500 μm and the size distribution is very <u>narrow</u>. In Example 1, the mean particle size of silica is 460 μm and in Example 1, the mean particle size of river sand is 600 μm.

As will be seen from pages 15-32 of D. R. Lide, *CRC Handbook of Chemistry and Physics*, CRC Press (included as Attachment 2 hereto), the density of slaked lime is 1.3-1.4 g/cm^3 and the density of quartz (SiO$_2$) or of fused silica is 2.65 g/cm^3 and respectively 2.21 g/cm^3.

One can conclude from this information that the properties of the fluidized bed are provided in order to entrain the little and light slaked lime particles, and not the big and dense particles of silica. In addition, if the Examiner is correct, and that some particles of sand are to be found in the final slaked lime powder, these particles will be of the same size as the particles of slaked lime, for example 15 μm or 2.5 μm in the case of Examples 1 or 2, or even finer because silica is denser than slaked lime.

From the above discussion the person skilled in the art will immediately understand that the slaked lime

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obtained according to the teaching of the analyzed prior art Japanese reference will never contain silica in the form of particles having a size greater than 90 µm.

Consequently, Applicant would submit that the present invention is novel with respect to the Japanese prior art.

Please note that with respect to the Examiner's contention that in Claim 1, the quantity of mineral solid flow agent could be equal to zero, that Applicant has specifically amended the original claim language to eliminate this possibility. The amended claim language now recites "which contains a quantity of a mineral solid flow agent selected from the group consisting of vermiculite, perlite, diatomaceous earth and silica, in the form of particles having a size greater than 90 µm ,said quantity of mineral solid flow agent being greater than zero and less than 5% by weight of the composition." Applicant would submit that such amendment is not "new matter" in that the original claim language stated that the "composition contains said agent". If the agent "is contained" in the composition, then it must be present in a quantity greater than zero.

The Examiner also rejected Applicant's original Claims 1-4 and 9-10 under 35 U.S.C. §103(a) as being "obvious" based upon the same Japanese reference (JP09-268012). Applicant respectfully disagrees with the Examiner's conclusion that the present invention is "obvious" with respect to the Japanese prior art. In the referenced Japanese prior art document, measures are taken in order to separate slaked lime powder from silica and if some particles of silica remain in the slaked lime powder, they are necessarily very fine and light.

On the contrary, in the present invention, the composition must contain coarse particles of the selected mineral solid flow agent in order to solve the problems of storage, handling and transport of the calcic compounds according to the invention. Very fine and light particles of silica in the composition will, therefore, fail to offer a solution to the problem at hand and, in fact, teach away from Applicant's solution to the problem.

Based upon the above arguments and amendments, Claims 1-10 are now thought to be allowable and an early notification of the same would be appreciated. Again, if any additional fee is due for the continued prosecution of this application, please charge the same to Applicant's Deposit Account No. 50-2555 (Whitaker, Chalk, Swindle & Sawyer, LLP).

Respectfully submitted,

Date: _May 8, 2009_

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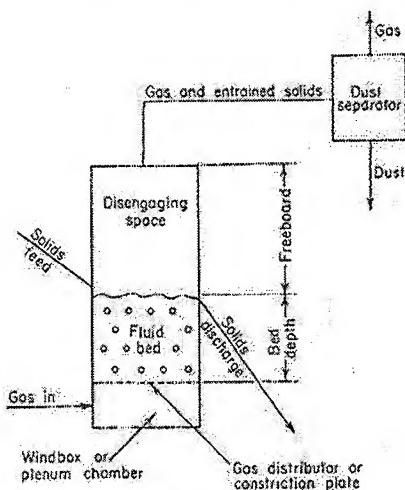
FIG. 20-76   Noncatalytic fluidized-bed system.

Many fluidized-bed units operate at elevated temperatures. For this use, refractory-lined steel is the most economical design. The refractory serves two main purposes: (1) it insulates the metal shell from the elevated temperatures, and (2) it protects the metal shell from abrasion by the bed and particularly the splashing solids at the top of the bed resulting from bursting bubbles. Depending on specific conditions, several different refractory linings are used [Van Dyck, *Chem. Eng. Prog.*, 46-51 (December 1979)]. Generally, for the moderate temperatures encountered in catalytic cracking of petroleum, a reinforced-gunnite lining has been found to be satisfactory. This also permits the construction of larger units than would be permissible if self-supporting ceramic domes were to be used for the roof of the reactor.

When heavier refractories are required because of operating conditions, insulating brick is installed next to the shell and firebrick is installed to protect the insulating brick. Industrial experience in many fields of application has demonstrated that such a lining will successfully withstand the abrasive conditions for many years without replacement. Most serious refractory wear occurs with coarse particles at high gas velocities and is usually most pronounced near the operating level of the fluidized bed.

Gas leakage behind the refractory has plagued a number of units. Care should be taken in the design and installation of the refractory to reduce the possibility of the formation of "chimneys" in the refractories. A small flow of solids and gas can quickly erode large passages in soft insulating brick or even in dense refractory. Gas stops are frequently attached to the shell and project into the refractory lining. Care in design and installation of openings in shell and lining is also required.

In many cases, cold spots on the reactor shell will result in condensation and high corrosion rates. Sufficient insulation to maintain the shell and appurtenances above the dew point of the reaction gases is necessary.

The violent motion of a fluidized bed requires ample foundations and sturdy supporting structure for the reactor. Even a relatively small differential movement of the reactor shell with the lining will materially shorten refractory life. The lining and shell must be designed as a unit.

Freeboard   The freeboard or disengaging height is the distance between the top of the fluid bed and the gas-exit nozzle in bubbling- or turbulent-bed units. The distinction between bed and freeboard is difficult to determine in fast and transport units (see Fig. 20-74).

At least two actions can take place in the freeboard (classification of solids and reaction of solids and gases, gases, or gases catalyzed by the solids).

As a bubble reaches the upper surface of a fluidized bed, the gas breaks through the thin upper envelope composed of solid particles entraining some of these particles. The crater-shaped void formed is rapidly filled by flowing solids. When these solids meet at the center of the void, solids are geysered upward. The downward pull of gravity and the upward pull of the drag force of the upward-flowing gas act on the particles. The larger and denser particles return to the top of the bed, and the finer and lighter particles are carried upward. Apparently the particles thrown into the freeboard have a random distribution of initial upward velocity and direction. As a result, the classification taking place in the freeboard of a fluidized bed can be mathematically described and predicted by the sharpness-index correlation developed and described by W. F. Carey and C. H. Bosanquet of Imperial Chemical Industries, Ltd., which can be used for all classifiers. $C/F = (D_p/D_{pc})^{SI}$, where C = weight ratio of particle size D_p remaining in bed, F = weight ratio of particle size D_p entrained, SI = sharpness index, and D_{pc} = cut size or particle size, equivalent to the particle whose terminal velocity equals the gas velocity.

The sharpness index is proportional to $(U^2/gz)^{-0.594} (\mu_c/\mu_0)$, or $SI = 0.80(U^2/gz)^{-0.594}(\mu_c/\mu_0)$, where U = superficial velocity, m/s; g = acceleration of gravity, m/s²; z = disengaging height, m; μ_c = viscosity of gas at conditions; and μ_0 = viscosity of gas at 25°C. This relationship does not hold for particles smaller that about 80 μm. These smaller particles are not entrained as readily as expected.

Several methods of predicting entrainment have been presented in the literature for bubbling and turbulent beds [Zenz and Othmer, op. cit.; Gugnoni and Zenz, in Grace and Matson (eds.), *Fluidization*, Plenum, New York and London, 1980; S. T. Pemberton, Ph.D. thesis, Cambridge University, 1982; Wen and Hashinger, *Am. Inst. Chem. Eng. J.*, 6, 220 (July 1960); Yagi and Aochi, *Soc. Chem. Eng. (Japan)*, spring meeting, 1955; and Merrick and Highley, *Am. Inst. Chem. Eng. Symp. Ser.* 70(137), 366-378 (1974)]. Entrainment even when carefully measured is nonconsistent over short periods of time (minutes). Several conclusions regarding entrainment found in the literature are erroneous because of the paucity of the data used and the lack of reproducibility of such data. Furthermore, most disregard the effect of disengaging height.

Entrainment increases as gas velocity increases, as gas viscosity increases, as vessel diameter increases, and as "fines" concentration increases. Entrainment decreases as disengaging height increases, as particle density increases, and as gravity increases.

Entrainment (mass of solids/mass of gas) is proportional to $(U^2/gz)^n$ (U = superficial gas velocity, m/s; g = acceleration of gravity, m/s²; z = disengaging height, m; n = exponent, usually about 1.5). Entrainment from beds of solids of different types (A, B, or D) as defined by Geldart (loc. cit.) differ. The same holds true if the particle-size distribution is bimodal. Entrainment from beds of Geldart (loc. cit.) Class A powers with a broad and continuous size distribution can be predicted by Eq. (20-55). The term (U^2/gz) has been corrected to the base case of gas at atmospheric conditions, a 1.0-m-diameter vessel, particles with a density of 1.0 gm/cm³, and a particle-size distribution resulting in a minimum fluidizing velocity (U^{mf}) of 1.0 m/s.

$$E = 0.154(U^2/gz)^{1.53} (D)^{0.75} (\mu_c/\mu_0)^{1.78} (1/\rho_s)^{2.5} (1/U_{mf})^{1.5}$$

where E, V, g, and z are as described above; D = vessel diameter, m; μ_c = viscosity of gas at conditions, kg/s·m; μ_0 = viscosity of gas at 25°C, kg/s·m; ρ_s = density of solids, gm/cm³; and U_{mf} = minimum fluidizing velocity, m/s.

Another method is presented in the following paragraphs. All predictions should be substantiated by data on the particular gas-solid system under consideration.

In batch classification, the removal of fines (particles less than any arbitrary size) can be correlated by treating as a second-order reaction $K = (F/\theta)[1/x(x - F)]$, where K = rate constant, F = fines removed in time θ, and x = original concentration of fines.

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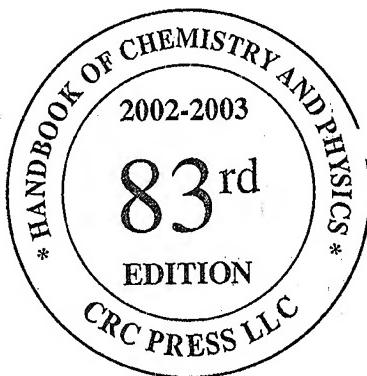
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DENSITY OF VARIOUS SOLIDS

This table gives the range of density for miscellaneous solid materials whose characteristics depend on the source or method of preparation.

REFERENCES

1. Forsythe, W. E., *Smithsonian Physical Tables, Ninth Edition*, Smithsonian Institution, Washington, 1956.
2. Kaye, G. W. C., and Laby, T. H., *Tables of Physical and Chemical Constants, 16th Edition*, Longman, London, 1995.
3. Brandrup, J., and Immergut, E. H., *Polymer Handbook, Third Edition*, John Wiley & Sons, New York, 1989.

Material	$\rho/\text{ g cm}^{-3}$	Material	$\rho/\text{ g cm}^{-3}$	Material	$\rho/\text{ g cm}^{-3}$
Agate	2.5-2.7	Pyrex	2.23	Soapstone	2.6-2.8
Alabaster,		Granite	2.64-2.76	Solder	8.7-9.4
carbonate	2.69-2.78	Graphite	2.30-2.72	Starch	1.53
sulfate	2.26-2.32	Gum arabic	1.3-1.4	Steel, stainless	7.8
Albite	2.62-2.65	Gypsum	2.31-2.33	Sugar	1.59
Amber	1.06-1.11	Hematite	4.9-5.3	Talc	2.7-2.8
Amphiboles	2.9-3.2	Hornblende	3.0	Tallow, beef	0.94
Anorthite	2.74-2.76	Ice	0.917	Tar	1.02
Asbestos	2.0-2.8	Iron, cast	7.0-7.4	Topaz	3.5-3.6
Asbestos slate	1.8	Ivory	1.83-1.92	Tourmaline	3.0-3.2
Asphalt	1.1-1.5	Kaolin	2.6	Tungsten carbide	14.0-15.0
Basalt	2.4-3.1	Leather, dry	0.86	Wax, sealing	1.8
Beeswax	0.96-0.97	Lime, slaked	1.3-1.4	Wood (seasoned)	
Beryl	2.69-2.70	Limestone	2.68-2.76	alder	0.42-0.68
Biotite	2.7-3.1	Linoleum	1.18	apple	0.66-0.84
Bone	1.7-2.0	Magnetite	4.9-5.2	ash	0.65-0.85
Brasses	8.44-8.75	Malachite	3.7-4.1	balsa	0.11-0.14
Brick	1.4-2.2	Marble	2.6-2.84	bamboo	0.31-0.40
Bronzes	8.74-8.89	Meerschaum	0.99-1.28	basswood	0.32-0.59
Butter	0.86-0.87	Mica	2.6-3.2	beech	0.70-0.90
Calamine	4.1-4.5	Muscovite	2.76-3.00	birch	0.51-0.77
Calcspar	2.6-2.8	Ochre	3.5	blue gum	1.00
Camphor	0.99	Opal	2.2	box	0.95-1.16
Cardboard	0.69	Paper	0.7-1.15	butternut	0.38
Celluloid	1.4	Paraffin	0.87-0.91	cedar	0.49-0.57
Cement, set	2.7-3.0	Peat blocks	0.84	cherry	0.70-0.90
Chalk	1.9-2.8	Pitch	1.07	dogwood	0.76
Charcoal,		Polyamides	1.15-1.25	ebony	1.11-1.33
oak	0.57	Polyethylene	0.92-0.97	elm	0.54-0.60
pine	0.28-0.44	Poly(methyl methacrylate)	1.19	hickory	0.60-0.93
Cinnabar	8.12	Polypropylene	0.91-0.94	holly	0.76
Clay	1.8-2.6	Polystyrene	1.06-1.12	juniper	0.56
Coal,		Polytetrafluoroethylene	2.28-2.30	larch	0.50-0.56
anthracite	1.4-1.8	Poly(vinyl acetate)	1.19	locust	0.67-0.71
bituminous	1.2-1.5	Poly(vinyl chloride)	1.39-1.42	logwood	0.91
Coke	1.0-1.7	Porcelain	2.3-2.5	mahogany	0.66-0.85
Copal	1.04-1.14	Porphyry	2.6-2.9	maple	0.62-0.75
Cork	0.22-0.26	Pyrite	4.95-5.10	oak	0.60-0.90
Corundum	3.9-4.0	Quartz (α)	2.65	pear	0.61-0.73
Diamond	3.51	Resin	1.07	pine, pitch	0.83-0.85
Dolomite	2.84	Rock salt	2.18	white	0.35-0.50
Ebonite	1.15	Rubber,		yellow	0.37-0.60
Emery	4.0	hard	1.19	plum	0.66-0.78
Epidote	3.25-3.50	soft	1.1	poplar	0.35-0.50
Feldspar	2.55-2.75	pure gum	0.91-0.93	satinwood	0.95
Flint	2.63	Neoprene	1.23-1.25	spruce	0.48-0.70
Fluorite	3.18	Sandstone	2.14-2.36	sycamore	0.40-0.60
Galena	7.3-7.6	Serpentine	2.50-2.65	teak, Indian	0.66-0.98
Garnet	3.15-4.3	Silica, fused,	2.21	walnut	0.64-0.70
Gelatin	1.27	Silicon carbide	3.16	water gum	1.00
Glass,		Slag	2.0-3.9	willow	0.40-0.60
common	2.4-2.8	Slate	2.6-3.3	Wood's metal	9.70
lead	3-4				